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Jim Moum

Ocean Turbulence Flux Measurements

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We have successfully developed a new dynamic pressure sensor to measure the downstream (vertical) component of velocity fluctuations from a vertical microstructure profiler in the ocean. The noise level is $O(1 \text{ mm/s})$ and the spatial resolution is $O(1 \text{ cm})$. We refer to this sensor as a pitot tube.

The pitot tube was successfully used in an experiment in an energetically turbulent tidal flow in British Columbia in March 1990 (as part of this program). Coincident measurements of larger scale vertical velocities using a downward-looking acoustic Doppler current profiler (Ann Gargett, Institute of Ocean Sciences, Canada) indicate that the inertial subrange of the turbulence encompasses the scales measured by both devices and that the measurements made by the 2 devices converge to the same scaling.

Other successful deployments have been made at the equator and in the main thermocline off northern California.

The correlation of vertical velocity fluctuations and temperature fluctuations yields directly the turbulent heat flux. We have made the first direct measurements of turbulent heat flux in the ocean and found that the scales dominating the flux are much greater than those which dominate the turbulent dissipation. This finding means that we can relax our spatial resolution constraints on sensors intended for flux measurements.

This sensor will be used in future experiments on our vertical profiler and potentially on towed and moored instrumentation. It provides us the opportunity to detect all 3 components of velocity fluctuations (together with shear probes) and to routinely determine the turbulent heat flux directly.

List of Publications

Profiler measurements of vertical velocity fluctuations in the ocean (Author: J.N. Moum), *J. Atmos. Ocean. Tech.*, 7, 323-333, 1990.

The quest for K_p - Preliminary results from direct measurements of turbulent fluxes in the ocean (Author: J.N. Moum), *J. Phys. Oceanogr.*, 20, 1980-1984, 1990.

Measuring turbulent fluxes in the ocean - the quest for K_p . (Author: J. N. Moum) in 'Parameterization of small-scale processes', Proceedings of Hawaiian winter workshop, U. Hawaii at Manoa, Jan 17-20, 1989, 145-156.

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